CITY OF ANNAPOLIS
MAIN STREET ROUTE REVERSAL STUDY

Prepared by Gorove/Slade Associates, Inc.

June 1994

CITY OF ANNAPOLIS
MAIN STREET ROUTE REVERSAL

EVALUATION OF ALTERNATIVES

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I. INTRODUCTION AND PURPOSE

In 1993 the City of Annapolis adopted the recommendation outlined in the Annapolis Ward I Sector Study. The purpose of this study was to develop comprehensive long range plan for managing the future needs of tourism, traffic and transportation, and managing the downtown commercial area in Annapolis, Maryland. A major concern of this study was the need to reduce the amount of traffic within the downtown area. The study recommended examining two possible traffic routing in order to reduce the amount of traffic in the downtown area. These recommendations are as follows:

- "Reversing the one-way traffic on Main Street and making Duke of Gloucester Street Two-way".

- "Returning Main Street to a two-way status, eliminating parking on one side, and keeping Duke of Gloucester Street one-way and adding parking to the other side".

In both of these alternatives, the flow of traffic on Green Street would be reversed.

The purpose of this study is to implement the recommendations of the adopted Ward I Sector Study by evaluating the two alternative traffic flow patterns for the downtown area noted above. These two alternatives, while potentially decreasing downtown traffic flow, would also achieve the goal of capturing the dramatic view of the harbor for arriving tourist.

Gorove/Slade Associates, Inc. analyzed the recommended alternatives and evaluated two additional alternatives to the existing traffic flow within the downtown area. Additionally, the existing traffic flow pattern was considered to be the "no-build" alternative and was evaluated. The four study goals which were the basis of this evaluation were:

1. Improve downtown traffic circulation.

2. Reduce through traffic on Main Street.

3. Create a calming effect on Duke of Gloucester Street by reducing vehicular speed.

4. Reduce traffic volumes on Green Street.

Sources of data for this study include: The City of Annapolis Department of Public Works, The City of Annapolis Department of Planning and Zoning, The Annapolis Department of Public Transportation, The Maryland State Highway Administration, meeting and conversation with the Annapolis Advisory Committee, Saint Mary's Roman Catholic School, The Annapolis City Police Department, and the Library files of Gorove/Slade Associates, Inc.

Methodology

To initiate this study Gorove/Slade Associates, Inc. collected data needed to complete the study objectives. This included conducting weekday AM and PM peak hour traffic counts on January 25, 1994 at the following intersections:

- Main Street at Church Circle
- Main Street at Francis Street
- Main Street at Conduit Street
- Main Street at Green Street
- Main Street at Memorial Circle
- Conduit Street at Gorman Street
- Duke of Gloucester Street at Church Circle
- Duke of Gloucester Street at Conduit Street
- Duke of Gloucester Street at Green Street
- Duke of Gloucester Street at Compromise Street

Twenty-four hour automatic traffic recorders were placed at the following locations in order to obtain directional traffic flow data to determine primary traffic movements through the downtown area:

- Duke of Gloucester Street between Church Circle and Charles Street
- Duke of Gloucester Street between Saint Mary's Street and Compromise Street
- Compromise Street between Duke of Gloucester Street and Saint Mary's Street
- Main Street between Church Circle and Francis Street
- Conduit Street, Green Street, Newman Street, and Saint Mary's Street between Main Street and Duke of Gloucester Street.

A summary of the existing traffic count data is illustrated in Figure 1.

In addition, a field reconnaissance of the downtown area was conducted in order to determine which existing parking spaces in the study area would be affected by the proposed alternatives. The field reconnaissance also identified the location of traffic control signs, traffic control devices, existing roadway striping, and bus stops, existing traffic flow constraints, sight distance and land access issues, curb geometrics, and other data relevant to evaluate the traffic flow alternatives. The field data collected was compiled in an existing conditions plan in an AutoCADD format. The base plan was provided by the City of Annapolis.

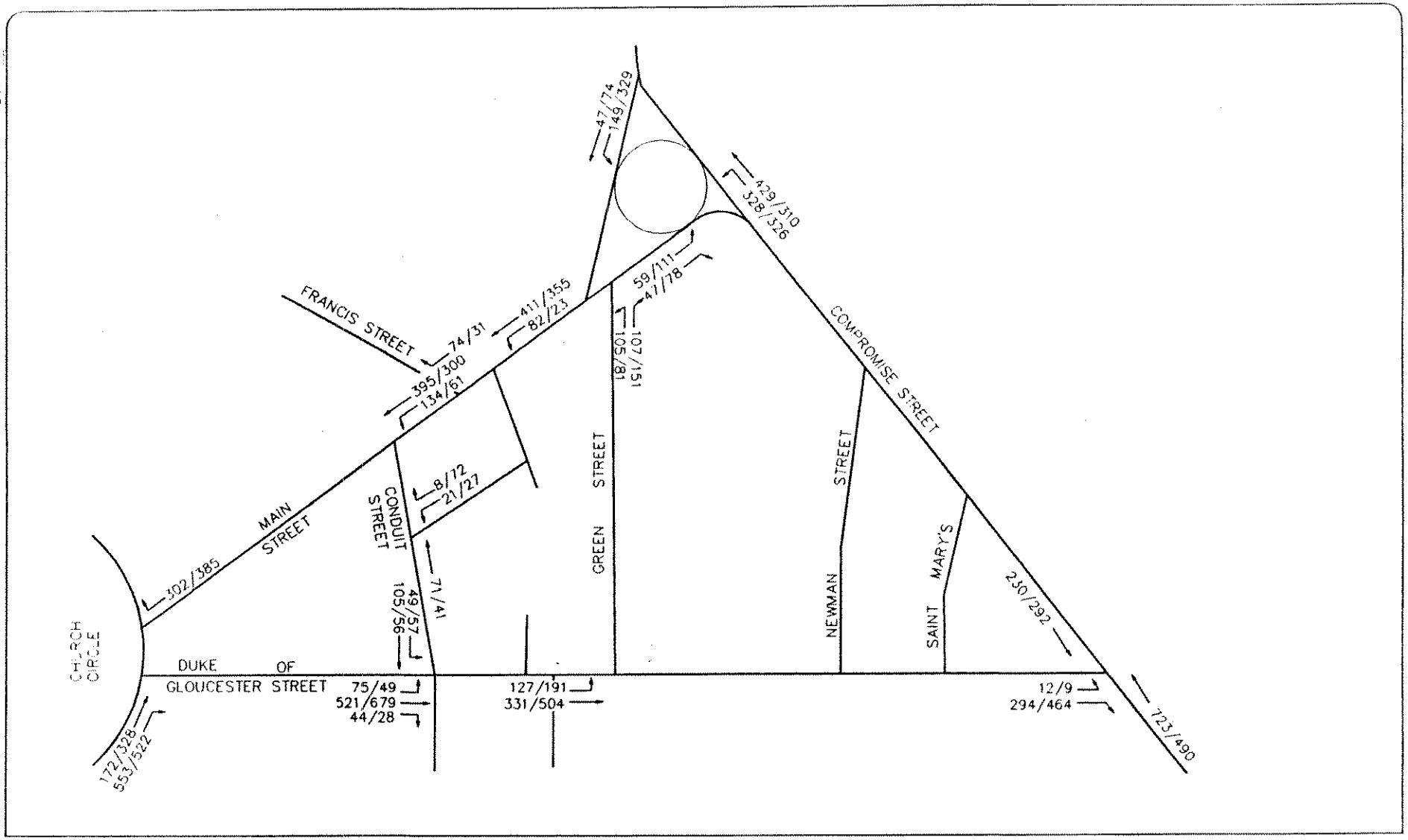

FIGURE 1
EXISTING TRAFFIC VOLUMES

MAIN STREET ROUTE REVERSAL
ANNAPOLIS, MARYLAND

GOROVE•SLADE ASSOCIATES, INC.

Review of Traffic Flow Alternatives

Gorove/Slade Associates, Inc. reviewed and analyzed four (4) alternatives to the existing traffic flow within the study area. The methodology was to evaluate these alternatives using standard traffic engineering techniques to determine the feasibility of each, while attempting to achieve the four study goals mentioned at the beginning of this report. The following is a general description of the four alternatives evaluated for this study:

- Alternative A: Assumes that both Main Street and Duke of Gloucester Street will remain one-way, however, the direction of traffic flow on both of these primary roadways will be reversed.

- Alternative B: Assumes that the one-way flow of traffic on Duke Of Gloucester Street will be reversed, and Main Street will become a two-way street.

- Alternative C: Assumes that Duke of Gloucester Street will be reversed, and Main street will become a one-way street eastbound from Church Circle to Conduit Street, and two-way from Conduit Street to Memorial Circle.

- Alternative D: Assumes that Duke of Gloucester Street will become a two-way street, and Main Street will be one-way eastbound.

Each of the four alternatives assumes that the flow of traffic on Green Street will be reversed, and that traffic channelization islands will be constructed at Memorial Circle. Figure 2 illustrates the four alternatives evaluated in this study.

Summary of Evaluation of Alternatives

The purpose of this study was to implement the recommendations of the adopted Ward I Sector Study by evaluating the existing and four alternative traffic patterns in the downtown area. Preliminary findings revealed that each of the four alternative traffic patterns accomplishes one or more of the four (4) goals stated at the beginning of this report. However, this examination revealed that each alternative has flaws that can disqualify it from being a realistic alternative for implementation. For example:

- Alternatives A, B and C accomplish the goals of capturing the view of the harbor, and improving circulation, however, none of these options reduce traffic on either Duke of Gloucester Street, Main Street, or Green Street. These alternatives create traffic conflicts at Church Circle at Main Street/Duke of Gloucester Street and Compromise at Duke of Gloucester Street.

  A major concern of Alternatives A, B, and C is the direction of traffic along Duke of Gloucester Street with respect to Saint Mary's School. In these scenarios, school children will be forced to be dropped off on Duke of Gloucester Street opposite the school. The children would then have to cross the street to access the school.

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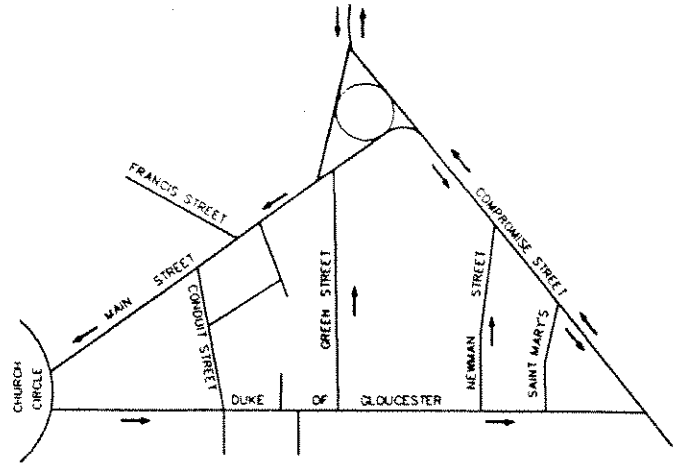
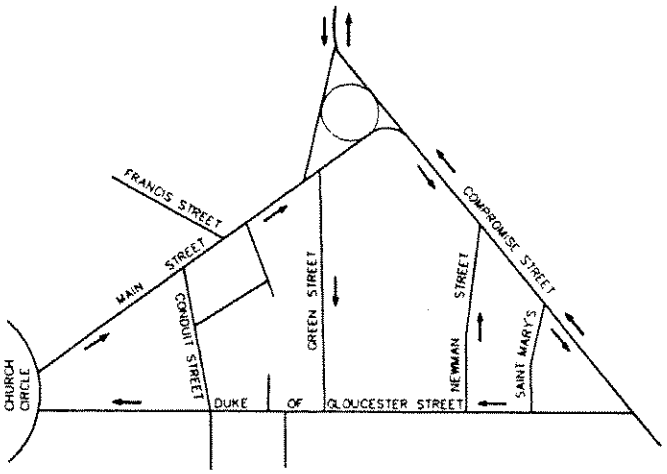
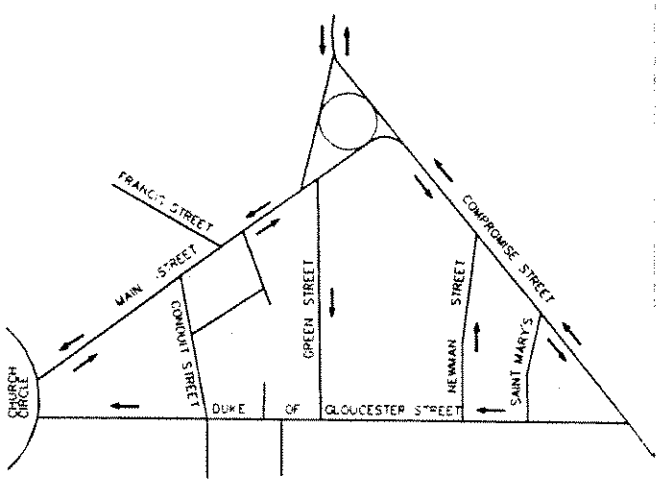


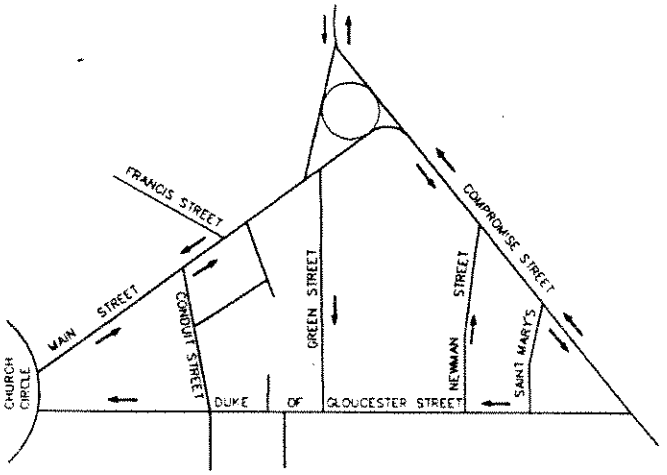
EXISTING TRAFFIC FLOW



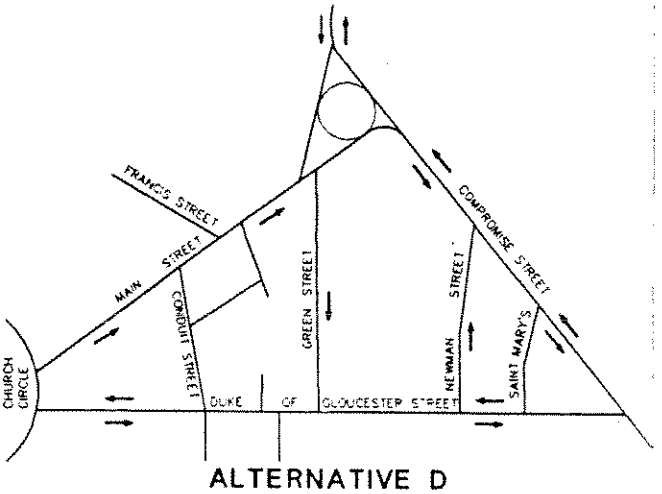
ALTERNATIVE A



ALTERNATIVE B



ALTERNATIVE C



ALTERNATIVE D

FIGURE 2
TRAFFIC FLOW ALTERNATIVES

North
Not to Scale

Additionally, the cost to implement Alternatives A, B, or C would be in excess of $300,000.00 each.

- Alternative D accomplishes the goals of obtaining a harbor view, improving circulation, and reducing traffic along Main Street and Green Street. However, this alternative makes Duke of Gloucester Street a two-way by-pass for the downtown area. This would double the traffic demand on Duke of Gloucester Street and create numerous vehicle turning movement conflicts at each side street intersecting Duke of Gloucester Street. Also, the width of Duke of Gloucester Street is sub-standard to comfortably support two-way traffic volumes.

In addition, each of the four alternatives studied would have a negative impact on commuter bus routes and school bus routes. A rerouting of bus and truck traffic would need to be assessed to implement these alternatives. These results indicate that implementing a single alternative will not satisfy the criteria outlined in the Ward I Sector Study, and that further analyses would be required to achieve the study recommendations.

Subsequent to the completion of the preliminary analysis, Gorove/Slade Associates, Inc. met with the City of Annapolis staff and the Downtown Annapolis Parking and Transportation Advisory Committee to discuss the findings of the study. Working with the City of Annapolis staff and the Advisory Committee a hybrid alternative (C-2) was developed as an option for implementation.

Gorove/Slade Associates, Inc. undertook an additional analysis to examine the feasibility of implementing Alternative C-2. This new alternative would maintain the existing traffic patterns and circulation with one change to the street system. This change would entail making Main Street a two-way street from Conduit Street to Memorial Circle. (A detailed description and an evaluation of this alternative are presented later in this report.)

II. EVALUATION OF EXISTING CONDITIONS

Existing Traffic Patterns

In order to accurately assess the impact associated with the four alternatives, an evaluation of existing traffic conditions was undertaken. Specifically, this analysis looked at existing traffic conditions as they relate to through traffic patterns within the downtown area. In addition, this analysis reviews physical constraints within the study area, and makes recommendations to improve traffic circulation.

An analysis of the existing traffic count data provided the basis for estimating the volume of through traffic for each of the six distinct through traffic routes within the downtown area. These six paths and that estimated morning and evening weekday peak hour traffic volumes are illustrated in Figure 3.

The estimated through trips and trips generated within the study area are summarized in Table 1A and 1B and in the following paragraphs:

- During the typical Winter morning peak hour, 1472 vehicles arrive and 1314 depart the study area. Approximately 1114 vehicles pass through the area with neither origin or destination; approximately 200 vehicle trips originate and 358 trips terminate in the area.

- During the typical Winter evening peak hour, 1415 vehicles arrive and 1562 depart the study area. Approximately 1215 vehicles pass through the area with neither origin or destination; approximately 347 vehicle trips originate and 200 trips terminate in the area.

- Thus, during these critical one-hour peak periods, through traffic constitutes approximately seven out of ten vehicles in the area.

Existing Constraints

Presently there are several noteworthy traffic-related constraints within the study area. These constraints are as follows:

- During the AM peak and early PM peak commuter periods significant traffic congestion occurs along Duke of Gloucester Street where the school buses and parents unload and pick-up children at the Saint Mary's School.

- The current configuration of Memorial Circle is confusing to motorists.

- The sight distance is inadequate at the intersection of Duke of Gloucester Street at Compromise Street.

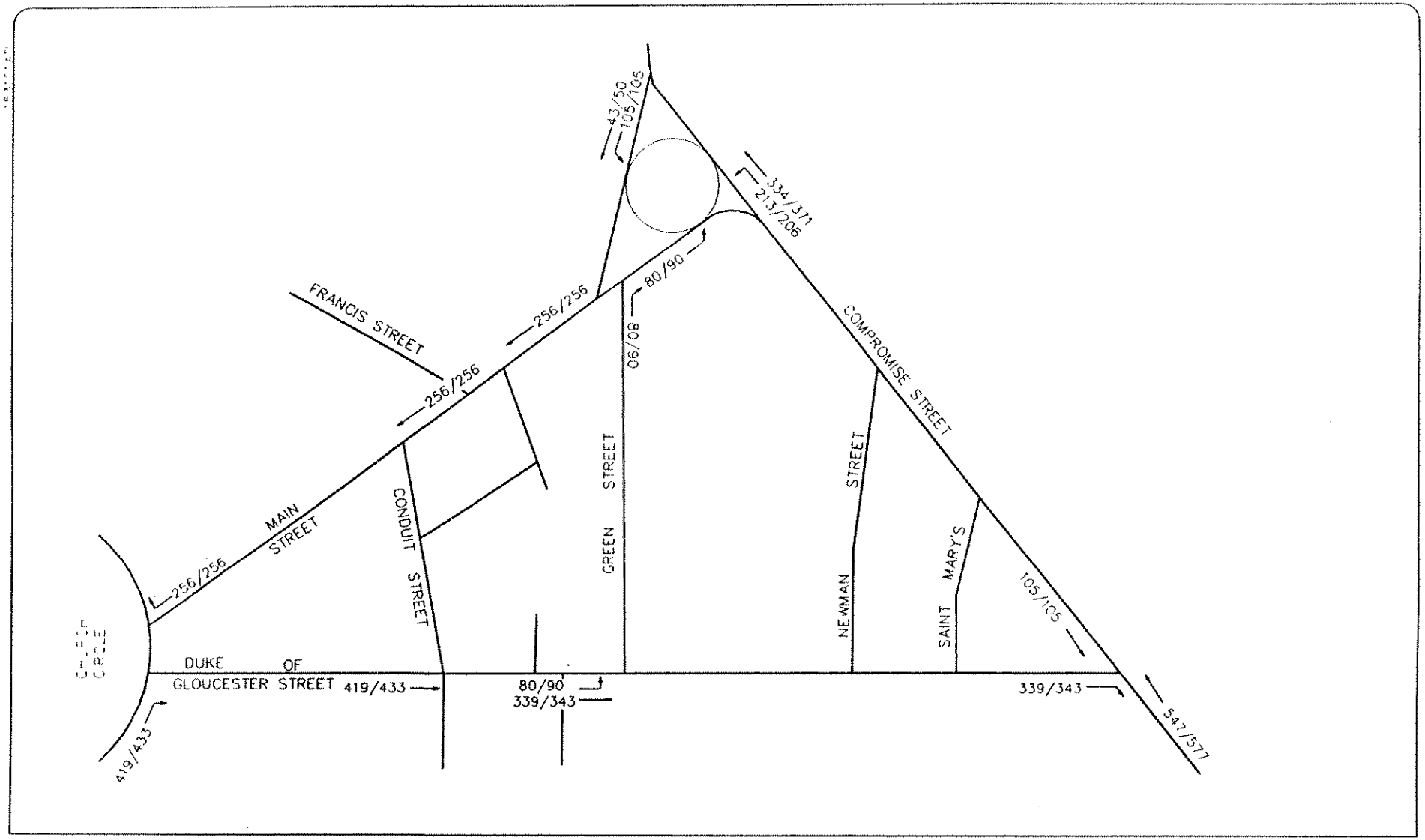


FIGURE 3
EXISTING TRAFFIC FLOW VOLUMES

MAIN STREET ROUTE REVERSAL
ANNAPOLIS, MARYLAND

GOROVE • SLADE ASSOCIATES, INC.

TABLE 1A
ANNAPOLIS
DOWNTOWN ORIGIN/DESTINATION PATTERNS -- AM PEAK HOUR

TO:	NORTH	EAST	WEST	SUBTOTAL	LOCAL	TOTAL
FROM:						
NORTH	0	105	43	148	48	196
EAST	334	0	213	547	176	723
WEST	80	339	0	419	134	553
SUBTOTAL	414	444	256	1,114	358	1,472
LOCAL	74	80	46	200		
TOTAL	488	524	302	1,314		

TABLE 1B
ANNAPOLIS
DOWNTOWN ORIGIN/DESTINATION PATTERNS -- PM PEAK HOUR

TO:	NORTH	EAST	WEST	SUBTOTAL	LOCAL	TOTAL
FROM:						
NORTH	0	105	50	346	57	403
EAST	371	0	206	421	69	490
WEST	90	343	0	448	74	522
SUBTOTAL	327	588	299	1,215	200	1,415
LOCAL	94	168	86	347		
TOTAL	421	756	385	1,562		

Recommendations for Existing Conditions

Assuming that the existing conditions constitute a possible alternative, recommendations for improvement to the existing situation were developed. Based on a review of the existing traffic, and physical constraints within the downtown area, the following recommendations will assist in improving existing downtown traffic circulation.

- Restrict left turning vehicles from eastbound Duke of Gloucester Street to northbound Compromise Street. This will reduce the potential for traffic accidents due to poor sight distance.

- Install traffic channelization barriers at the approaches to Memorial Circle. This improvement will aid the smooth operation of traffic entering the circle by creating a physical barrier between traffic entering the circle and traffic within the circle. This physical barrier will also act as a pedestrian island on Main Street, and will force trucks that load within the painted island to park in areas that will not obstruct traffic. Also, additional traffic control signs should be installed warning motorists to yield to traffic in the circle.

- Presently, only one possible solution is available to correct the traffic congestion that occurs along Duke of Gloucester Street in front of Saint Mary's School. It was suggested by the Annapolis Advisory Committee that a mountable curb be constructed in front of the school for buses to pull off the street onto the sidewalk. This use of the sidewalk would be restricted to school buses during the school morning and afternoon peak hour only. In addition, representatives of Saint Mary's School stated that the school has implemented a traffic control plan for both the AM and PM peak periods. This traffic control plan entails staggering student arrivals, initiating car pools, a staging the departure and arrival of students. Unfortunately, the amount of control the school has over the AM student drop-off time is limited.

III. EVALUATION OF ALTERNATIVES

The four alternatives described in the introduction, and the alternative to maintain and improve existing traffic operations were evaluated in terms of the four study goals. Also, each alternative was evaluated from the standpoint of traffic operations and safety considerations, access to specific sites such as schools, and other key traffic and parking considerations. Order of magnitude cost estimates were also prepared to assist the city staff in the decision making process. This chapter presents a summary of the evaluation.

Change in Through Traffic Patterns

Alternatives A, B, and C transfer eastbound and westbound through traffic from Main Street to Duke of Gloucester and vice versa, resulting in an increase in through traffic on Main Street of over 150 vehicles in the AM and PM peak hours, and a reduction of over 200 vehicles on Duke of Gloucester Street.

Alternatives A, B and D do not provide a direct route through the study area for traffic from the north to the west. Alternative C does provide a route for this origin - destination pattern: Memorial Circle to Main Street to Conduit Street to Duke of Gloucester Street to Church Circle.

Alternative D would reduce through traffic on Main Street by making Duke of Gloucester Street the main carrier of all east-west through traffic. This would increase through traffic on Duke of Gloucester Street by over 200 vehicles during morning and evening peak commuting periods.

Through traffic that currently uses Green Street is in the range of 80 to 90 peak hour vehicles. These vehicles would be transferred onto Main Street in each of the four alternatives.

Impact on Traffic Operations

A) Conflicts at Intersections

- Alternatives A, B, and C will introduce a crossing and "weaving" traffic conflict on Church Circle between Duke of Gloucester and Main Streets. This will cause a deterioration in the level of service and increase delays and congestion.

- Alternative D will also reduce intersection levels of service at Church Circle, but to a lesser extent than A, B, and C. In addition, alternative D will create additional intersection turning movement conflicts at Duke of Gloucester at Compromise Street.

B) Capacity of Streets to Carry Increased Traffic Demands

- Alternatives A, B, and C do not create street capacity issues.
- Alternative D will cause Duke of Gloucester Street to operate under substandard conditions. Major congestion points will occur at cross streets unless separate left-turn lanes can be provided, and at locations where vehicles must stop to unload passengers unless midblock turnouts can be established.

C) Geometric Constraints

- All of the alternatives will require modifications to the curb geometry at Church Circle and Main Street.
- Right turns from eastbound Compromise Street to westbound Duke of Gloucester Street will be prohibited due to curb geometry; these turns will be made via St. Mary's Street.
- Alternatives C and D will create vehicular turning movement constraints for motorists making right turns from the side streets onto Duke of Gloucester Street, and vice versa. Intersection turn radii must be increased to accommodate this alternative.

Impact on Land Access

A) General Circulation Patterns

- Ideally, every study area block would have clockwise round-the-clock circulation patterns. This permits all right turns and permits passenger loading at the curb from the right side of the vehicle.
- Each of the alternatives does improve general circulation patterns in comparison with the existing situation.
- The alternatives are relatively alike from this standpoint. Alternative D does provide more circulation flexibility than the other alternatives.

B) Specific Land Access Issues for:

- Parking Facilities
  - Alternative A will require the reorientation of existing angled parking spaces along Main Street.

- Alternative B will require the elimination of metered parking spaces along the north side of Main Street, and a reorientation of the angled parking spaces along the southern part of Main Street.

- Alternative D requires eliminating all side-street parking on Duke of Gloucester Street and the re-orienting of angled parking on the south end of Main Street.

None of the four alternatives will have an impact on the ingress and egress of traffic from the Noah Hillman Parking Garage.

- Schools

  - Alternatives A, B and C will require children attending the Saint Mary's School to be dropped off on Duke of Gloucester Street opposite the school. Children will have to cross Duke of Gloucester Street to access the school.

  - Presently, we do not anticipate any impact on the Green street Elementary School for any of the four alternatives.

Impact on Parking

Alternatives A through D each impact parking within the study area. The following table summarizes the impact on parking associated with each alternative.

TABLE 2
Impact on Existing Parking Supply

ALTERNATIVE	LOST METERED SPACES ON MAIN ST.	LOST UNMETERED SPACES ON DUKE OF GLOUCESTER ST.	TOTAL LOST SPACES
A	3	4	7
B	31	0	31
C	5	0	5
D	3	77	80

The total number of metered parking spaces on Main Street = 74.
The approximate number of side street parking spaces for Duke of Gloucester Street = 77.

Estimated Costs of Implementation

- All of the alternatives require reconstruction of a Baltimore Gas and Electric vault on Church Circle between Duke of Gloucester and Main Streets at a cost of approximately $60,000. Additional cost to increase the turn radius of this intersection is estimated at $10,000.

  Also, these alternatives will require the reconstruction of the traffic signals at Conduit Street, Duke of Gloucester, and at Main Street. The estimated cost to reconstruct the traffic signals at Church Circle is $50,000, and the estimated cost to reconstruct the two traffic signals on Conduit Street is $20,000.

- Additional cost will be incurred to reorient traffic control signs and to increase turn radii at several intersections.

- Each of the alternatives may require the installation of a traffic signal at Duke of Gloucester Street and Compromise Street. The cost for this improvement is $80,000.

- Alternative C requires the increase of the right-turn radius at Main Street and Duke of Gloucester Street.

Other Related Impacts

A) Bus Routes

- For alternatives A, B, and C, existing public and private bus routes can be revised to accommodate changes in traffic patterns.

- Alternative D will require significant changes to school bus routing due to the turning radius required for buses.

B) Safety Issues

A number of traffic and pedestrian safety issues are of concern for each of the four alternatives.

- Alternative A inverts the traffic flow between Duke of Gloucester and Main Street. Pedestrian and traffic conflict will be similar to existing; however, traffic will be moving downhill on Main Street and will require that motorists increase stopping distances between cars. In addition, the forward sloping incline might make parallel parking maneuvers more difficult.

- Alternatives B and C increase the traffic flow along Main Street, hence, increasing vehicular and pedestrian conflicts. Also, these alternatives are

similar to Alternative A with respect to the safety issues of vehicle morning downhill.

- Alternative D increases the traffic on Duke of Gloucester Street and presents conflicts between pedestrians and vehicles, particularly at St. Mary's School. Also, due to the two-way traffic pattern on Duke of Gloucester, the number of vehicular turning movement conflicts will be increased at each intersection on Duke of Gloucester Street.

Table 3 summarizes the impacts of alternatives A and D.

Summary of Evaluation

This evaluation has shown that each of the alternatives can achieve several of the four goals. However, it was determined that each of the four alternatives has one or more significant problems or flaws which disqualify it. These fatal flaws are summarized as follows:

1. The alternatives which make Duke of Gloucester Street one-way westbound:

   a. transpose the one-way, east-west pair and create significant traffic conflicts n Church Circle and at the intersection of Compromise and Duke of Gloucester Streets,

   b. cause St. Mary's School buses to load students on the north side of Duke of Gloucester Street and create an unsafe street crossing situation, and

   c. do not relieve the through traffic volumes on Main Street.

2. The alternative which makes Duke of Gloucester Street two-way can relieve through traffic on Main Street and keep school children loading on the near side of the street. However, Duke of Gloucester Street is not wide enough for two-way operation. At a minimum, all curb parking would have to be prohibited at all times, and Saint Mary's school loading operations would have to be accommodated off street. Even then, truck and bus turning movements onto and off of Duke of Gloucester Street would encroach into on-coming traffic lanes.

As a result of these severe flaws, a hybrid alternative was developed and evaluated. This is described in the next chapter.

Table 3
Preliminary Summary of Improvement for Each Alternative

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Alternative	Harbor View	Improved Traffic Flow	Improved Block Circulation	Reduction of Traffic On Main Street	Reduction of Traffic On Green Street	Infrastructure Improvements	Estimated Cost	Lost Parking	School Impact	Bus Route Impact
Existing	No	N/A	N/A	N/A	N/A	*Construct Raised Median To Channelize Traffic At Memorial Circle *Improve Conduit Street Traffic Signals *Add'l Public Parking Facility Trail Blazing Signs		N/A	N/A	N/A
A	Yes	N/A	Yes	No	No	*Move BG&E Vault *Modify Church Circle Signals *Increase Main Street Duke of Gloucester Radii *Modify Conduit Street Signals *Construct Channelization Medians at Memorial Cir. *Restrict Right Turns From Compromise Street To Duke of Gloucester Street and Possible Traffic Signal *Re-sign Downtown Area	$60,000 $50,000 $30,000 $20,000 $50,000 $80,000 $20,000	3 Metered	St. Mary's Pupils Discharged On Wrong Side Of Street	
B	Yes	?	Yes	No	Yes	*Same as "A", Plus: *Restrict Left Turn From Main St. to Francis St.	Same as "A"	31 Metered	Same as "A"	
C						"A" + "B", Plus: *Increase Turn Radii From Conduit Stree To Eastbound Main Stree *Increase Turn Radii From Conduit Street To Westbound D. of Glouces.	"A" + "B" $8,000 $8,000	5 Metered	Same as "A"	
D	Yes	No	Yes	Yes	Yes	"A" + "B", Plus: *Increase Turn Radii At Green Stree/Duke of Gloucester Street *Add Midblock Turnouts For Passenger Loading At St. Mary's School	"A" + "B" $8,000 $25,000	3 Metered 77 Non-Metered	N/A	

IV. ALTERNATIVE C-2

As a result of the analysis conducted on alternatives A, B, C, and D, a hybrid alternative was developed by integrating alternative C with existing conditions. Specifically, Alternative C-2 resembles existing conditions with one distinct difference. The section of Main Street between Conduit Street and Memorial Circle will become a two-way street with side street parking where feasible. Figure 5 illustrates the traffic flow for Alternative C-2.

The concept behind Alternative C-2 was that it would create a gateway to the City of Annapolis and provide a view of the harbor after motorists make the turn from Conduit Street. Vehicles accessing the downtown area from Church Circle would proceed down Duke of Gloucester and have the option of turning left on Conduit Street, or remaining on Duke of Gloucester Street to access the downtown area. Visitors will be directed to use Conduit Street to access the downtown by means of trail-blazing signs at the top of Duke of Gloucester Street.

Additionally, Green Street will remain one-way northbound, and continue to allow left and right turns onto Main Street. It should be noted that Green Street can easily be limited to right turns only onto Main Street by extending the proposed curbed median on Main Street. Restricting left-turning vehicles from Green Street onto Main Street should only be implemented if significant vehicular delay occurs on Green Street. Vehicular delays may occur due to insufficient gaps in traffic to allow access to Main Street created by the two-way directional traffic on Main Street.

Alternative C-2 was evaluated based on the same standards for evaluating alternatives A through D.

Change in Through Traffic Patterns

Alternative C-2 will transfer traffic entering the downtown area via Duke of Gloucester Street from Green Street to Conduit Street. This change in traffic patterns could divert approximately 80 cars during the AM peak hour, and 90 cars during the PM peak hour from Green Street to Conduit Street. In addition, the amount of traffic diverted from Green Street to Conduit Street would increase during the weekends and peak tourist times due to the trail-blazing signs which would be posted at Conduit Street. Traffic accessing the downtown area from Eastport along Compromise Street, and from the Naval Academy along Randall Street would not be affected by the alternative.

Impact on Operations

Alternative C-2 would not create any significant traffic conflicts at intersections within the study area. However, it should be noted that vehicle turning movement conflicts will be increased along Main Street. These conflicts will be primarily due to motorists traveling eastbound on Main Street who want to turn left onto Francis Street, and motorists traveling westbound on Main Street wishing to turn left onto Gorman Street. Based on the direction of Francis Street and Gorman Street, the increased turning movement conflicts will not be significant.

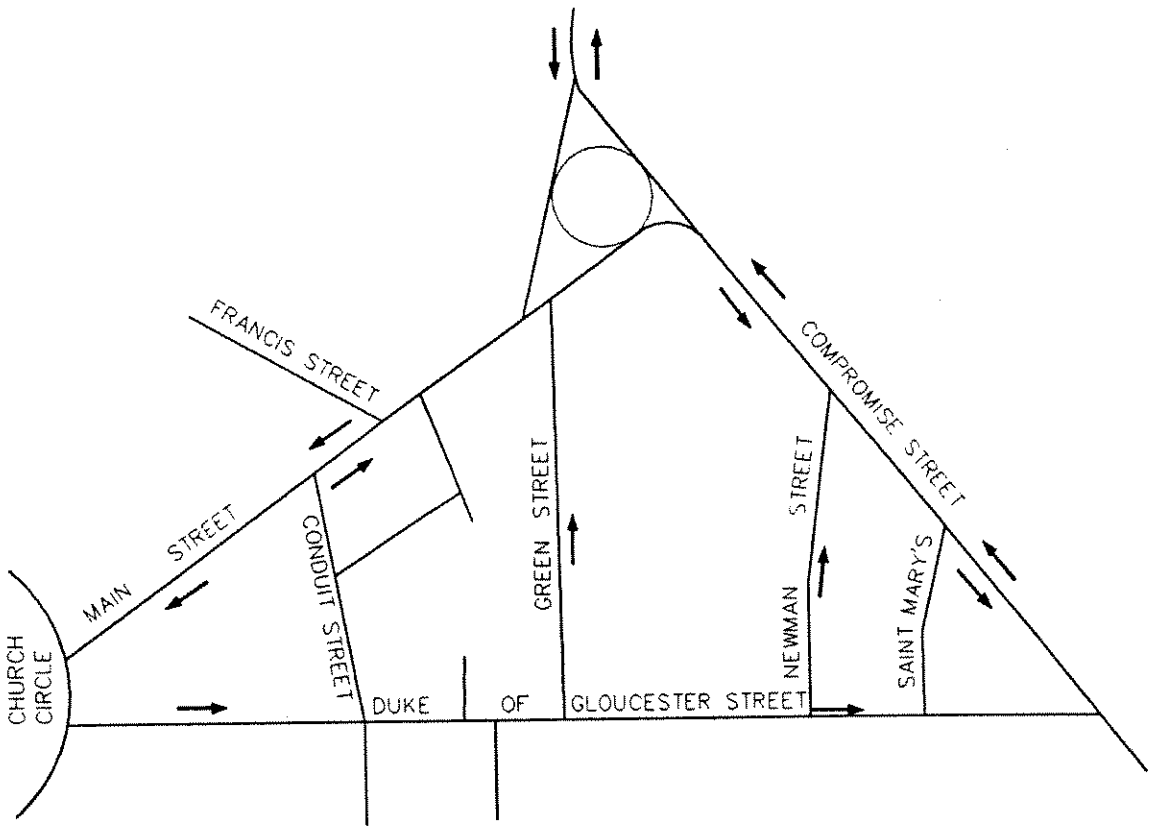

FIGURE 5
TRAFFIC FLOW ALTERNATIVE C-2

North
Schematic

Also, Alternative C-2 will have little effect on reducing vehicular speeds on Duke of Gloucester Street, and no long-term solution to correct the speeding problem is proposed at this time. While there are several methods to reduce speeds of vehicles on this type of roadway, further study would be necessary to identify an appropriate solution for this facility to achieve a reduction in speeds and maintain sufficient traffic flow conditions.

Geometric Constraints

Based on an analysis of the existing road network, several geometric constraints were identified for this alternative. These constraints are as follows:

- The left turn curb radius from Duke of Gloucester Street to Conduit Street is too small to accommodate truck traffic. Also, the curb radius from northbound Conduit Street to eastbound Main Street is too small to accommodate truck traffic. Both of these deficiencies can be corrected by restricting trucks and buses from turning left from Duke of Gloucester Street to Conduit Street.

- The left turn movement from Duke of Gloucester Street to Compromise Street should be restricted due to poor sight distance. This movement can be accommodated by channeling traffic via Saint Mary's Street to access Compromise Street.

At this time, no other geometric constraints have been identified with Alternative C-2.

Impacts on Land Access

General Circulation Patterns

As noted earlier, ideally, each block should have a clockwise circulation pattern round-the-block. Alternative C-2 circulation patterns are similar to existing, with Green Street and Conduit Street acting as primary traffic circulation routes. It should be noted that Green Street plays a key role in traffic circulation, and can be reversed depending on the needs of the community. This issue will be discussed later in the evaluation.

Specific Land Access Issues

A review of the impact of Alternative C-2 on parking revealed that approximately seven metered parking spaces would have to be removed along Main Street. However, it should be noted that approximately fourteen parking spaces can be added to Duke of Gloucester Street east of Saint Mary's Street. This is possible due to the proposal that Duke of Gloucester Street be reduced to one lane to accommodate right-turning vehicles only at Compromise Street.

An overview of the traffic circulation patterns associate with Alternative C-2 revealed that no modification will be necessary to accommodate existing commuter and school bus routes within the downtown area, and that no other land access issues were identified at this time.

Cost of Implementation

The estimated cost of implication of Alternative C-2 is significantly lower than Alternatives A through D. Primary expenses associated with Alternative C-2 would be installation of proposed and removal of existing signs within the downtown area. Other expenses would include the cost of roadway paint markings, traffic channelization at Memorial Circle, and the installation of yellow flashing beacons at the intersection of Compromise Street at Duke of Gloucester Street. Also, it should be noted that the City of Annapolis would lose revenue due to the loss of seven metered parking spaces along Main Street. This revenue can be offset if the City decides to meter the new parking spaces on Duke of Gloucester Street.

Summary

Alternative C-2 satisfies the goals of the study by creating a gateway effect to the City of Annapolis by making Main Street two-way south of Conduit Street. Also, this alternative reduces the amount of traffic utilizing the east end of Duke of Gloucester Street and Green Street. This alternative does improve the efficiency of the existing circulation with a two-way section of Main Street.

Alternative C-2 does not reduce the amount of traffic utilizing Main Street. However, the City has the opportunity to reduce the amount of through traffic in the downtown area during the reconstruction of Main Street. This final goal may be achieved if the City uses the available media to advise the public not to use the downtown area as a commuter corridor to access US Route 50 and other points of destination. Also, the use of regional traffic routing signs should be placed at key locations throughout the City to direct traffic away form the downtown historic area.

V. FINDINGS AND RECOMMENDATIONS

In general, downtown traffic conditions would benefit from the implementation of Alternative C-2 in terms of achieving the objectives stated at the beginning of this report. The objectives of the study are to improve downtown traffic circulation, reduce through traffic on Main Street, create a calming effect on Duke of Gloucester Street by reducing vehicular speed, and to reduce traffic volumes on Green Street. The results reached in terms of the C-2 analysis are as follows:

1. Alternative C-2 will improve downtown circulation by making Main Street two-way between the single block of Main Street and thereby creating additional flexibility for circulating traffic within the downtown area. Currently, Main Street is only accessible from Duke of Gloucester Street via Green Street, which is frequently congested. Alternative C-2 would provide two opportunities to enter the downtown for the Church Circle and Duke of Gloucester Street direction.

2. Alternative C-2 may have some impact on reducing through traffic on Main Street because it will reduce the westbound capacity of Main Street. This report includes recommendations to implement a city-wide program to direct motorists to bypass Main Street and the downtown via other alternate routes.

3. Alternative C-2 will assist in reducing the volume of traffic that currently utilizes Green Street because it will provide an alternative for traffic entering the downtown parking areas from Church Circle and Duke of Gloucester direction. This change will reduce the impact of traffic on residences and the school on Green Street and, because Conduit Street is shorter than Green Street and has fewer homes, the impacts of an increase in traffic will affect fewer sensitive properties.

4. Alternative C-2 would not be likely to reduce speeds on Duke of Gloucester Street. This objective will require further examination prior to implementing any speed control mechanisms. Options available for speed control are presented in this chapter.

5. Alternative C-2 would provide a view the harbor as motorists turn onto Main Street from Conduit Street. This view is not as dramatic as the view down Main Street from Church Circle. However, the view will add to the overall experience for first-time and occasional visitors to downtown Annapolis.

6. Alternative C-2 would not relieve congestion problems which currently exist in downtown Annapolis. It would shift congestion from Green Street onto Conduit Street and onto the proposed two-way section of Main Street. This change in congestion patterns would have some negative impacts. They are relatively minor and difficult to quantify.

In summary, this study has determined that the primary alternatives which would reverse the flow of traffic on Duke of Gloucester Street or would make Duke of Gloucester Street two-way are

not feasible. However, a less disruptive alternative does exist: the City can achieve several of its objectives by making Main Street two-way between Conduit Street and Memorial Circle (Alternative C-2). This alternative is recommended because it would provide an additional route to downtown parking from the west and would relieve congestion on Green Street. It is felt that these benefits outweigh the principal impact of this alternative which could result in more congestion on the proposed two-way segment of Main Street.

Whether Alternative C-2 is implemented or the City decides to make no changes in one-way street patterns, this study recommends a number of improvements which are summarized in the following paragraphs:

1. Restrict left-turning vehicles from eastbound Duke of Gloucester Street to northbound Compromise Street. This will reduce the potential for traffic accidents due to poor sight distance.

2. Install traffic channelization barriers at the approaches to Memorial Circle. Also, install traffic control signs warning motorists to yield to traffic in the circle. These improvements will aid the smooth operation of the traffic circle, will act as a pedestrian island on Main Street, and will force trucks that load within the painted island to park in areas that will not obstruct traffic.

3. Construct a pull-off area on Duke of Gloucester Street in front of Saint Mary's School for the exclusive use of school buses during the morning and afternoon peak hours only. This pull-off will obstruct flow on the sidewalk in these areas, but benefits of safer, unimpeded traffic flow on Duke of Gloucester Street outweigh the inconvenience to pedestrians for a relatively short period of time on weekday mornings and afternoons.

4. Study alternatives for reducing speeding on Duke of Gloucester Street. A special study of alternatives is necessary to address this problem. Possible alternatives include:

    - more emphatic signage to indicate speed restrictions coupled with more local law enforcement;

    - additional traffic control devices, including stop signs and/or an additional traffic signal; and,

    - unusual solutions such as a radar device, which would measure the speed of approaching vehicles and trigger a red traffic signal when vehicles are speeding.

5. Develop a program to encourage residents of Annapolis and persons who work in Annapolis to use traffic routes which do not pass through the historic downtown area. An opportunity will be available when Main Street is closed for reconstruction for motorists to find alternate routes. The local Annapolis cable television network and the newspapers should be engaged to encourage motorists to identify one or more alternatives to driving through the historic district. Then after Main Street is reopened, motorists should be encouraged to continue to use the alternative routes.

This program should be augmented by identifying and providing trail blazing signs along alternative routes around the downtown area.